AGI ENERGY SERVICE CENTRE
Sustainable Energy for Profitability

HOW ACTING ON THE HOT WATER AND STEAM SYSTEMS CAN IMPROVE YOUR ELECTRICAL ENERGY EFFICIENCY

The production of hot water and steam systems are often significant energy users (SEU) in commercial and industrial (C&I) facilities. The two main questions are therefore:

1 How big is the share of this energy consumer on total energy consumption?
2 How big is the grade by which the energy efficiency (EE) of the consumer can be improved?

It is therefore meaningful to take a closer look at these systems. In warm countries such as Ghana, space heating is usually not necessary or available, but warm water is required as well for industrial processes, for showers or other purposes. Generation of steam is even more expensive. This is because the hot water must change its physical state in order to become steam, which requires a lot of energy. These systems are usually in the heart of all energy auditing activities. What are the applicable EE measures?

01 Heat recovery

Waste heat arises in almost all industrial companies. Before purchasing an additional boiler for hot water or steam preparation, you should therefore consider whether warm water and steam can be obtained through heat recovery by using a heat exchanger from blow-down (steam) for example. Various facilities are suitable for this. The relationship between the amount of waste heat and the amount of hot water and steam required in an industrial company is usually positive so that, ideally, a large part of the hot water and pre-heated steam required can be generated using waste heat.

02 Solar thermal water heating

In hotels for example, there is often not enough waste heat available. Solar thermal systems should be considered here. Water is heated in tubes by the power of the sun e.g., the water is heated purely with renewable energy. This heated water can be used directly for pre-heating of steam systems; for showers or swimming pools, it is usually used via a heat exchanger.

03 Absorption chiller

Many organizations need refrigeration systems for room cooling, for food cooling, or for various further processes. The standard refrigeration system is a compressor refrigeration system. The technology is well-tried and tested and comparatively cheap but requires a relatively large amount of electricity. An absorption chiller requires less than 5% electricity of a compressor refrigeration.

This type works with heat conversion. An absorption chiller makes sense when the heat it uses is free (or very cheap). Then its operation is much cheaper than that of a standard compressor machine with electricity and the poor efficiency is then not much a priority. So, if an organization needs cold and heat (in significant quantities) at the same time, an absorption chiller can be considered and may reduce the overall cost of cold and heat generation systems.

04 CHP and CCHP

Cogeneration or Combined Heat and Power (CHP) is a module or plant which generates heat and electricity at the same time. If both is needed (in significant quantities) in an organization a CHP system may be feasible.

A combination of a CHP with an absorption chiller is also possible. In this case the system is named CCHP (Combined Cold, Heat and Power). In ideal case (for example in a hotel) a well-dimensioned CCHP system can generate most of the needed electricity, cold and heat on site.

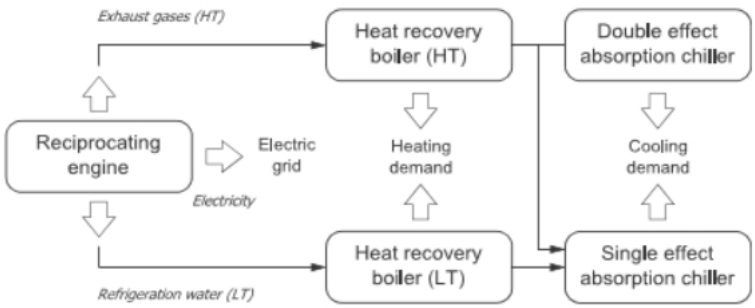

Fig. 1- General Structure of a CCHP system

05 Check if steam is necessary

Hence the first question in a steam system is whether steam is necessary at all. When steam is used for cleaning purposes, which is practical, but also energy-intensive, hot water may be sufficient. However, steam contains a high amount of energy which makes cleaning with steam faster than with hot water.

Many companies also generate steam for their production units and then convert it back into hot water for some other consumers. This is an extreme waste of energy and mostly affects historically grown industrial or commercial setups, which were partly planned and built at times when energy was cheaper.

Consumers that do not need to be operated with steam can be removed from the network or the network can be optimized.

06 CHP and CCHP

Old boilers are inefficient and should be replaced after 20 to 25 years at the latest. Modern boilers offer 2 to 3 flues and built-in economizers (heat exchangers). With these technologies modern boilers achieve efficiencies of up to 96%, while old boilers sometimes have an efficiency of less than 85%.

The efficiency can thus be increased significantly. Of course, replacing the boiler is a very costly measure and needs to be planned carefully.

07 Initiate a steam trap program

Scheduled checking of steam traps has been considered as best practice for many years. The repair and replacement of leaking traps can significantly reduce steam costs.

08 Boiler process control

Boiler control systems can improve the efficiency of the boilers by monitoring carbon monoxide, oxygen and smoke in the flue gases and maintaining the right flame temperature and air intake. This is especially recommended by using more than one boiler.

For additional information on this opportunity, please contact:

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